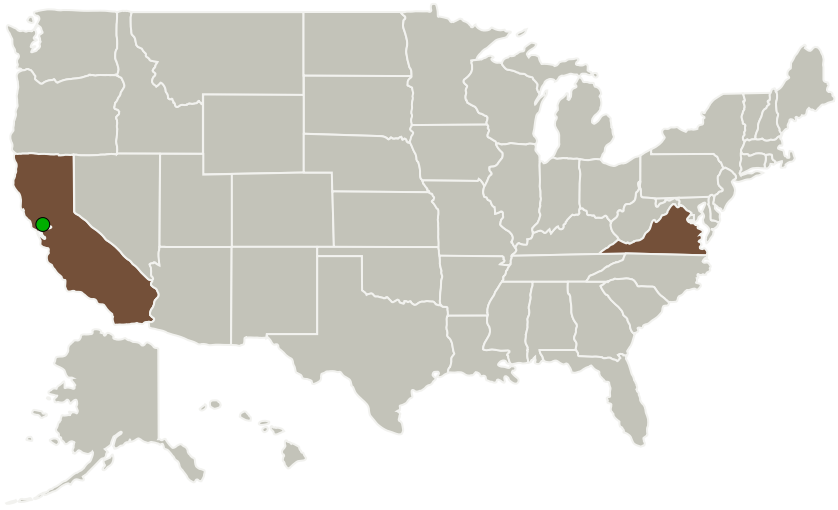
# Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase II

Completed Technology Project (2016 - 2019)

## Project Introduction

Crown Consulting, Inc., proposes a new method of verification and validation for autonomous operations by using cloud computing resources for massively parallel execution of National Airspace System (NAS) simulations. This method increases by an order of magnitude the number of Monte Carlo simulation runs that can be executed in a given time, enabling assessments of safety and performance across thousands of scenarios. Uses of this innovation include verification and validation of concepts for autonomous UAS operations, validation of advanced NAS concepts, and development of SMART NAS. Phase II will develop and demonstrate the concept by creating a sUAS SMART NAS Testbed simulation running thousands of cases simultaneously, along with automated system performance and safety assessment. Applications to NASA needs include analysis of concepts for UAS operations, prognostic safety assessment, NAS performance assessment, exploring applications of autonomy, and real-time evaluation of traffic flow strategies.

## Primary U.S. Work Locations and Key Partners



Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase II

## Table of Contents

**Small Business Innovation Research/Small Business Tech Transfer**

# Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase II

Completed Technology Project (2016 - 2019)

| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| Crown Consulting, Inc. | Lead Organization | Industry<br>Minority-Owned Business, Small Disadvantaged Business (SDB) | Arlington, Virginia |
| Ames Research Center(ARC) | Supporting Organization | NASA Center | Moffett Field, California |

| Primary U.S. Work Locations | |
|---|---|
| California | Virginia |

## Project Transitions

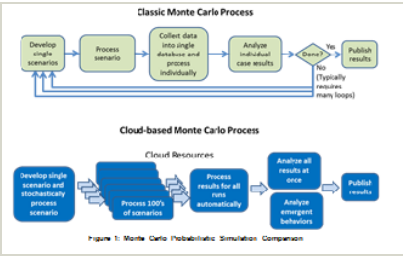
**June 2016:** Project Start

**March 2019:** Closed out

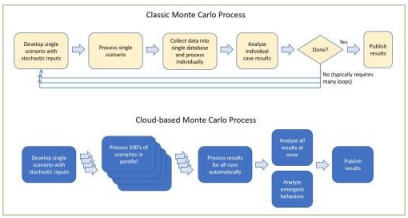
**Closeout Documentation:**

- Final Summary Chart*(https://techport.nasa.gov/file/139876)*

## Images




**Briefing Chart Image**
Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase II *(https://techport.nasa.gov/image/130696)*




**Final Summary Chart Image**
Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase II *(https://techport.nasa.gov/image/137231)*

## Organizational Responsibility

**Responsible Mission Directorate:**
Space Technology Mission Directorate (STMD)

**Lead Organization:**
Crown Consulting, Inc.

**Responsible Program:**
Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**
Jason L Kessler

**Program Manager:**
Carlos Torrez

**Principal Investigator:**
Paul Cobb

**Co-Investigator:**
Paul N Cobb

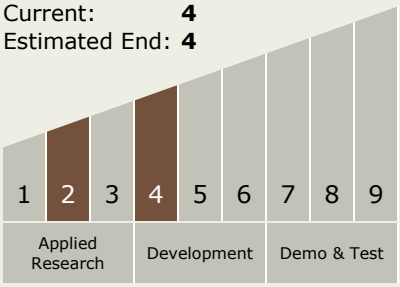
# Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase II

Completed Technology Project (2016 - 2019)

**Final Summary Chart Image**
Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase II
*(https://techport.nasa.gov/image/135996)*

## Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**




## Technology Areas

**Primary:**

- TX16 Air Traffic Management and Range Tracking Systems
  - TX16.4 Architectures and Infrastructure

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System